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International Baccalaureate®  
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**BIOLOGY  
HIGHER LEVEL  
PAPER 1**

Friday 9 May 2014 (afternoon)

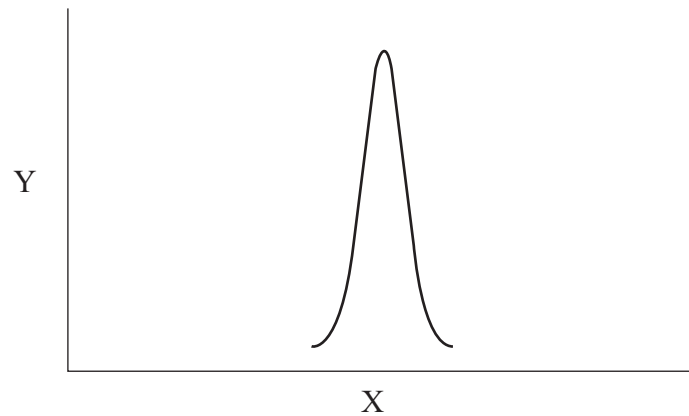
1 hour

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**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is *[40 marks]*.

1. Results from a scientific study produced a graph with this appearance.



What can be concluded about the study?

- A. The standard deviation of X is high
  - B. 68 % of the population has the mean value for X
  - C. The graph suggests that Y causes X
  - D. There is little variation in X
2. Though a single nerve cell does not think, millions of them organized as a brain result in thinking. What kind of property does thinking represent?
- A. Anatomical
  - B. Adaptive
  - C. Extracellular
  - D. Emergent
3. Why are stem cells useful in repairing diseased or damaged organs?
- A. They are specialized
  - B. They reproduce
  - C. Unlimited quantities are available from adult tissue
  - D. They can be transferred between species

4. Which structures have a phospholipid bilayer?
- I. vesicle
  - II. nucleus
  - III. nucleoid
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II, and III
5. Which usually takes the most time in the cell cycle?
- A. Cytokinesis
- B. Interphase
- C. Telophase
- D. Anaphase
6. Which is a disaccharide?
- A. Fructose
- B. Galactose
- C. Lactose
- D. Ribose

7. How much energy is stored in 1 kg of body fat compared to 1 kg of glycogen?
- A. Half as much
  - B. Same amount
  - C. Twice as much
  - D. One tenth as much
8. Which element is most common in proteins?
- A. Sodium
  - B. Nitrogen
  - C. Phosphorus
  - D. Iron
9. Which nucleic acids are directly involved in transcription?
- A. mRNA and one DNA strand
  - B. mRNA and both DNA strands
  - C. tRNA and both DNA strands
  - D. tRNA and one DNA strand

10. What is the result after the first meiotic division of one diploid animal cell containing  $2n$  chromosomes?

	Number of cells	Chromosomes per cell
A.	2	$n$
B.	2	$2n$
C.	4	$n$
D.	4	$2n$

11. Which blood group genotype shows codominance?

- A.  $I^A I^A$
- B.  $I^B i$
- C.  $I^A I^B$
- D.  $ii$

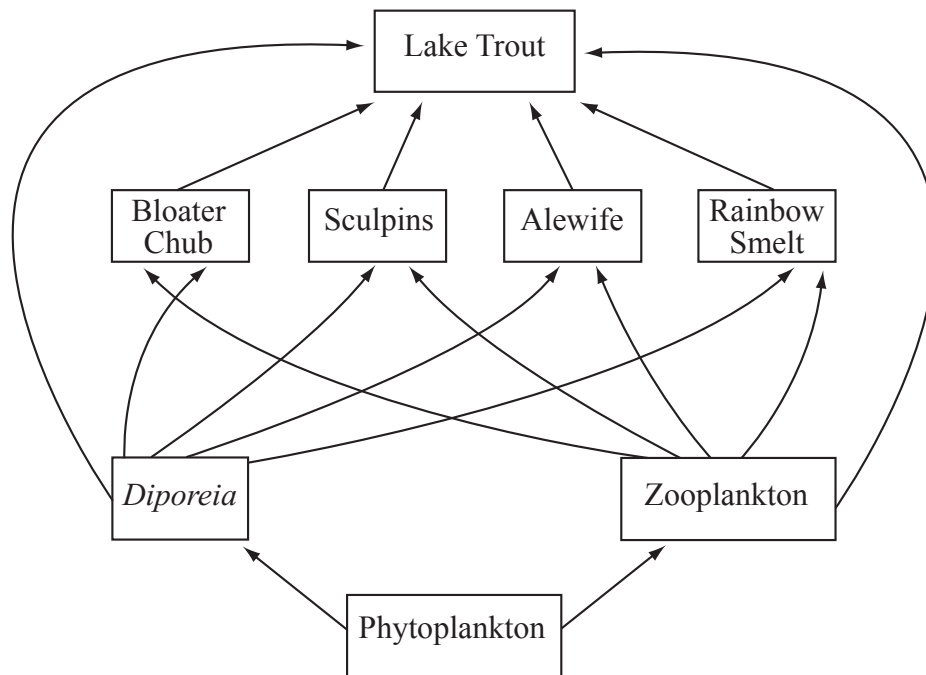
12. What term describes genetically identical organisms derived from a single parent?

- A. Species
- B. Clone
- C. Family
- D. Twins

13. What provides evidence for the universal nature of the genetic code?

- A. Uracil replaces thymine in RNA
- B. The amount of A is equal to the amount of T and the amount of G is equal to the amount of C
- C. Nucleic acids contain the same bases in all species
- D. mRNA codons are assigned to the same amino acids in different species

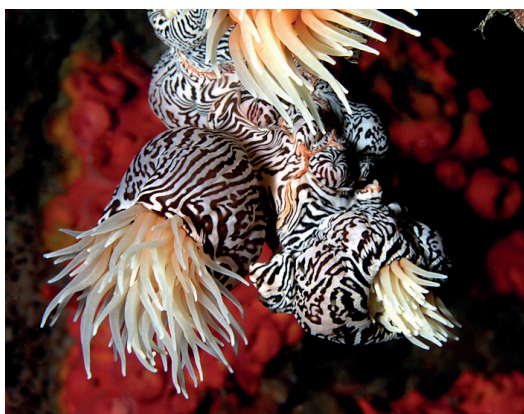
14. The diagram shows a simplified Lake Michigan foodweb. Which pair of terms describes the trophic level of lake trout?



A.	secondary consumer	herbivore
B.	tertiary consumer	detritivore
C.	secondary consumer	tertiary consumer
D.	secondary consumer	primary consumer

15. How does the precautionary principle affect the planning of public projects?
- Supporters of any project must prove that it will not cause harm.
  - Opponents of any project must prove that it will cause harm.
  - Precautions must be taken to prevent harm to biodiversity during construction of the project.
  - Precautions must be taken to prevent harm to biodiversity after construction of the project.

16. Which images show cnidaria?



I.



II.



III.



IV.

[Source: Image I: [http://en.wikipedia.org/wiki/File:Striped\\_colonial\\_anemone.jpg](http://en.wikipedia.org/wiki/File:Striped_colonial_anemone.jpg)

Image II: <http://en.wikipedia.org/wiki/Chrysaora#mediaviewer/File:Six-Sea-Nettles.jpg>

Image III: [http://en.wikipedia.org/wiki/Sponge\\_reef#mediaviewer/File:Aphrocallistes\\_vastus.jpg](http://en.wikipedia.org/wiki/Sponge_reef#mediaviewer/File:Aphrocallistes_vastus.jpg)

Image IV: <https://www.flickr.com/photos/rling/4117004436/in/photolist-9RkRe2-7gNHZ7-fXy94L-9RoLGE-4BpZst-7vEWYh-fYoqEy-HBTmE-7ycJTZ-4xPQCf-4BugJu-6WZ43r-cGCT4f-4sRQ6n-jQZqui-x2jYA-65FSvo-axV1Bn-3zZxbQ-bhFtxe-7yguGu-oq99W-6LvtZu-2jxeXE-6X455o-6e6Jed-b7Kgq-616qYF-5jRYsg-a3fGe7-4txFok-9Jvwq3-6WZ3zB-2kcrN3-8qgaUZ-aHoJre-4tBJtb-7jbocF-8RX3cj-6X4539-vdArk-6oiVcA-4eD5Q2-cwcT6y-nQfGHe-4fHLVJ-moGP8-AiZHq-7uMTD9-5R2uQ7/lightbox/> by Richard Ling]

- A. I and II only
- B. I and III only
- C. II and IV only
- D. III and IV only

17. Which sequence of taxonomic groups goes from largest to smallest?

A.	phylum	order	class	species	genus
B.	kingdom	family	class	genus	species
C.	phylum	class	order	family	species
D.	kingdom	phylum	family	order	genus

18. The longest region of the large intestine is the colon. What is the function of the colon?

- A. Produces enzymes
- B. Absorbs fats
- C. Destroys *E. coli*
- D. Solidifies wastes

19. What describes antigens?

- A. They catalyze immune reactions.
- B. They activate specific white blood cells.
- C. They destroy bacteria but not viruses.
- D. They are only produced by white blood cells.

20. Where does gas exchange occur in humans?

- A. Mouth and nostrils
- B. Alveoli walls
- C. Bronchiole walls
- D. Trachea and bronchi



**21.** Where could an action potential occur in a motor neuron?

- A. Anywhere on the cell membrane
- B. Dendrites only
- C. Cell body only
- D. Axon only

**22.** Which hormone concentration rises to trigger ovulation during the menstrual cycle?

- A. Estrogen
- B. FSH
- C. Progesterone
- D. LH

**23.** What must be present for a human fetus to develop into a normal male?

	<b>X chromosome</b>	<b>Y chromosome</b>	<b>testosterone</b>
A.	✓		✓
B.	✓	✓	
C.		✓	✓
D.	✓	✓	✓

**24.** What helps to regulate transcription?

- A. Nucleosomes
- B. DNA polymerase
- C. tRNA
- D. Ribosomes

25. In this electronmicrograph of a eukaryotic nucleus, what could be happening to DNA at any of the arrows?



[Source: © Phototake Image 119621. Used with permission.]

- I. Replication
  - II. Transcription
  - III. Translation
- A. I
  - B. II
  - C. I or II
  - D. I, II or III

**26.** Immunoglobulin G (IgG) is a type of antibody consisting of folded polypeptide chains and a bound carbohydrate group. Which level of structure would describe the 3D (three dimensional) shape of any **one** of the chains?

- A. Primary
- B. Secondary
- C. Tertiary
- D. Quaternary

**27.** What is found in mitochondria but not in chloroplasts?

- A. Stroma
- B. DNA
- C. Enzymes
- D. Matrix

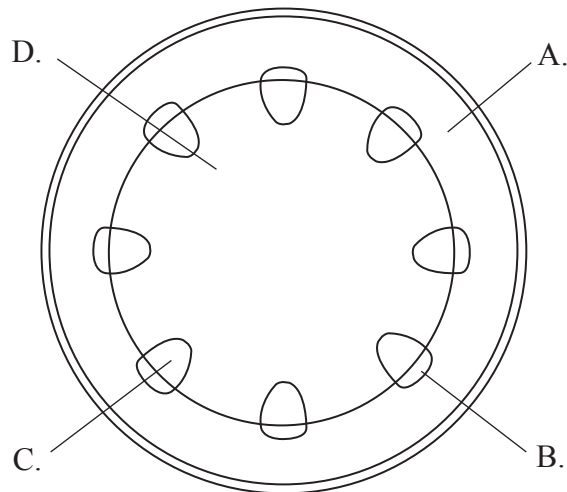
**28.** What changes could occur during oxidation?

	<b>hydrogen</b>	<b>electrons</b>
A.	loss	loss
B.	loss	gain
C.	gain	gain
D.	gain	loss

29. What is produced **overall** per glucose molecule, during glycolysis?

A.	1 pyruvate	2 ATP	1 NADH
B.	1 pyruvate	4 ATP	2 NADH
C.	2 pyruvate	4 ATP	1 NADH
D.	2 pyruvate	2 ATP	2 NADH

30. Where does the translocation of sugars occur in a plant stem?



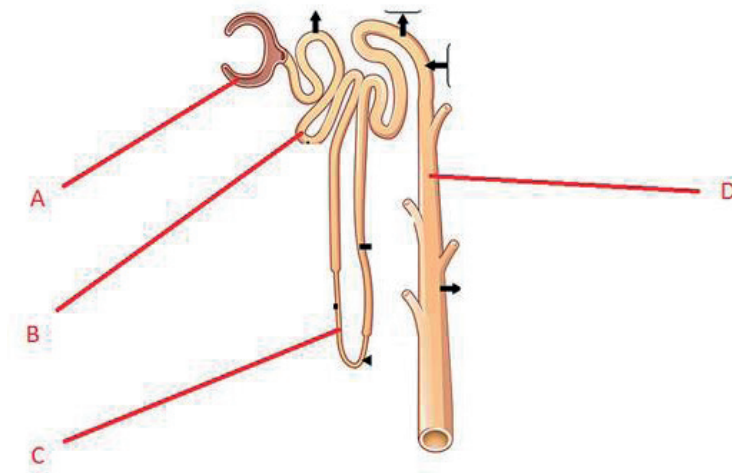
31. To where are pollen grains delivered during successful pollination?

- A. Style
- B. Stigma
- C. Ovary
- D. Anther

32. During seed germination, what carbohydrate moves from cotyledons to the embryo?
- A. Fructose
  - B. Starch
  - C. Maltose
  - D. Sucrose
33. When do homologous chromosome pairs separate during meiosis?
- A. Prophase I
  - B. Anaphase I
  - C. Metaphase II
  - D. Anaphase II
34. One model for skin colour proposes three separately inherited codominant genes that can affect darkness. Each dark-skin allele (P, Q or R) contributes one equal unit of darkness. The recessive alleles do not contribute to darkness. Which genotype would likely produce the same skin darkness as PpQqRr?
- A. PpQQRr
  - B. ppQqRR
  - C. PpqqRr
  - D. PPqqRR
35. During an immune response, what is the clonal selection phase?
- A. Survival of individuals with B cells needed for immunity to a disease
  - B. Gene rearrangement for B cell diversity
  - C. Proliferation of a specific B cell
  - D. Antibody secretion by specific B cells

- 36.** What is the role of cartilage in the elbow joint?
- A. Allows easy movement between bones
  - B. Secretes synovial fluid
  - C. Connects triceps muscle to forearm bones
  - D. Prevents dislocation of humerus from forearm bones
- 37.** Where do sperm complete their development and become able to swim?
- A. Sperm duct
  - B. Seminal vesicle
  - C. Seminiferous tubules
  - D. Epididymis
- 38.** What is the role of the cortical reaction in fertilization?
- A. Attracts large numbers of sperm to an egg
  - B. Allows the plasma membranes of one sperm and one egg to fuse
  - C. Results in formation of second polar body to produce haploid egg
  - D. Prevents multiple sperm from fertilizing the egg
- 39.** Which structural component is repeated in a myofibril?
- A. Sarcomere
  - B. Sarcolemma
  - C. Sarcoplasmic reticulum
  - D. Nucleus

40. The diagram shows a nephron and associated blood vessels from a human kidney. Which structure produces a high solute concentration in the medulla?



[Source: [http://en.wikipedia.org/wiki/File:2618\\_Nephron\\_Secretion\\_Reabsorption.jpg](http://en.wikipedia.org/wiki/File:2618_Nephron_Secretion_Reabsorption.jpg)]